Homework 4

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Using Monte Carlo Simulation, write an algorithm to calculate an approximation to π by considering the number of random points selected inside the quarter circle

$$Q : x^2 + y^2 = 1, x \geq 0, y \geq 0$$

where the quarter circle is taken to be inside the square

$$S : 0 \leq x \leq 1 \; and \; 0 \leq y \leq 1$$

Use the equation $\frac{\pi}{4} = area; \frac{Q}{area} S$.

```
set.seed(1234)

monte_carlo <- function(n){
  counter = 0
  for (i in 1:n){
    y <- runif(1, 0, 1)
    x <- runif(1, 0, 1)
    if ((x^2 + y^2) < 1){
      counter <- counter + 1
    } else {
      counter <- counter
    }
  }
  return(counter)
}
```

```
n <- 500
(monte_carlo(n)/n)*4
```

```
## [1] 3.104
```

```
n <- 50000
(monte_carlo(n)/n)*4
```

```
## [1] 3.14312
```

2 Page 194: problem 1

Use the middle-square method to generate.

2.1 a.

10 random numbers using $x_0 = 1009$

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